WO 2004/090430
PCT/EP2004/001037

Recirculation Cooling System

The invention relates to a recirculation cooling system, having a refrigeration circuit and a water circuit, wherein the refrigerator circuit, together with the evaporator, liquefier and compressor, has been placed into a receiver housing, wherein the evaporator is arranged in heat-exchanging contact with the water circuit, wherein the water circuit has a tank and a pump assigned to the latter, both of which have been placed into a receiver housing.

Such recirculation cooling systems are employed for the air-conditioning of switchgear cabinets or machine tools. In the process, cooling capacity is provided to the water circuit by the refrigeration circuit. The cooled water is then available as the cooling medium.

In most cases, the recirculating cooling systems are in a close spatial arrangement next to the units to be cooled, for example the machine tool. For reasons of space requirements, they are often considered to be interfering there.

It is the object of the invention to create a recirculation cooling system of the type mentioned at the outset, which is distinguished by a particularly compact structure and can be positioned in a service-friendly manner, requiring little space.

This object is attained in that the rear wall of the receiver housing is placed against a vertical lateral panel of, for example, a switchgear cabinet, a machine housing or a wall, and the receiver housing is fastened on the latter, that the interior of the receiver housing is divided into two partial spaces by means of a separating wall, wherein the one partial space is arranged between the lateral panel and the separating wall, and the second partial space between the

separating wall and the front of the receiver housing, that the liquefier and the fan are arranged in the partial space assigned to the front of the receiver housing, and the tank, as well as the pump, to the rear partial space, and that each of the partial spaces is accessible from the assigned sides of the receiver housing.

It is therefore provided by means of the invention to create a recirculation cooling system which, in contrast to what has been customary up to now, no longer needs to be placed on the ground, but can instead be suspended from the vertical lateral panel or wall.

It is housed there in a space-saving manner. A technician has easy access when needed. For servicing the outer circuit of the refrigeration circuit, which is connected with the surroundings, the front partial space of the receiver housing is easily accessible from the front. If service work has to be performed in connection with the water circuit, the device can be removed from the wall/lateral panel and the second partial space is accessible through the open back.

In accordance with a preferred embodiment variation of the invention it is provided that the evaporator is housed in the rear partial space of the receiver housing. The evaporator has been displaced into the second, rear partial space, where it is protected against soiling by the surroundings which might possibly occur in the outer circuit (front partial space). The ease of service is further increased in this way.

A possible invention embodiment could be distinguished in that a return line of the water circuit is assigned to the evaporator and, adjoining the evaporator, terminates in the tank, in that a feed line branching off the pump runs out of

the tank, that the feed and the return lines are both conducted to the roof area of the receiver housing and project therefrom at least by means of connectors for water circuit lines. By conducting the lines in this way it is easily possible to perform the replenishing of the water circuit from the side of the cover of the recirculation cooling system.

Because the feed and return lines with the connectors are fastened on the cover of the receiver housing, a connection with the system(s) to be cooled can be easily provided. The connectors are housed stably and in a protected manner.

The ease of servicing of the recirculation cooling system can also be increased in that an electronic control device is housed in a lateral receiving area of the receiver housing and is accessible via a separate service cover in the area of the lateral wall of the receiver housing.

A preferred variation of the invention provides that the partial area at the front is connected with the surroundings via at least one opening, that the openings are arranged in the front wall of the receiver housing, wherein the fan and the liquefier are connected with the surroundings through the openings, and that the openings are constituted by covers, or are overlapped by covers, which conduct the airflow provided to the liquefier and the fan in different directions by means of guide elements. With this arrangement the air guidance of the outer circuit is connected with the surroundings only via the front side of the housing. In this way the recirculation cooling system can also be installed in a space-saving manner directly at the side of adjoining housings or the like.

In order to maintain a low structural depth it can be

provided for the fan to be a radial fan and for the pump to be an immersion pump, which is inserted into a tank which is tall in respect to its structural depth.

A further embodiment variation of the invention is such that the compressor of the refrigeration circuit is arranged in a receiving area which bridges the two partial spaces and is accessible via the front of the receiving housing. If service is required, the compressor is accessible via the front of the device.

The invention will be explained in greater detail in what follows by means of an exemplary embodiment represented in the drawings. Shown are in:

Fig. 1, a rear view of a recirculation cooling system,

Fig. 2, the recirculation cooling system in Fig. 1 in a plan view from the right side,

Fig. 3, the recirculation cooling system in Figs. 1 and 2 in a front view and with covers applied, and

Fig. 4, the representation in accordance with Fig. 3 in a plan view from the left side.

A recirculation cooling system is represented in Figs. 1 and 2. It has a receiver housing 10 with a rear wall 12 and a front wall 11 arranged parallel in respect to the latter. A floor 13, a cover 14 and lateral walls 16 extend between the rear wall 12 and the front wall 11.

A separating wall 15 is arranged parallel in respect to the rear wall 12 and the front wall 11. It separates the receiving space surrounded by the receiver housing 10 into two partial spaces.

A liquefier 32 and a fan 31 of a refrigeration circuit are housed in the partial space assigned to the front of the device. The fan 31 is embodied as a radial fan. It aspirates air from the surroundings via the open front wall

11 along its axis of rotation and blows it out radially. The air is then conducted through the liquefier 32 and is released, warmed again, through the open front wall 11 to the surroundings.

An evaporator 22 of the refrigeration circuit is arranged in the second partial space of the receiver housing 10. A compressor 34 of the refrigeration circuit is arranged in the area of the floor 13 of the receiving housing 10. It is arranged in a connecting area bridging the two partial spaces. In this case the compressor 34 is arranged in such a way that its connecting side and electrical shielding are accessible through the front wall 11. The individual components of the refrigeration circuit are connected with each other by means of coolant lines 33. Components of a water circuit 20 are housed in the rear partial space. For service purposes, the rear wall 12 is designed to be open. This rear partial space receives a tank 24, into which a pump 23 has been inserted. The pump 23 is designed as an immersion pump. The tank 24 is connected with the evaporator 22 via a return line 25. The return line 25 is conducted through the evaporator 22. Following the evaporator 22, the return line 25 leads to the cover 14. It is fastened there to the connector 21.

The feed line 26 is also maintained on the cover 14 by means of a connector 21 and leads to the pump 23.

As Figs. 3 and 4 show, the open front wall 11 is closed off by means of covers 41, 42. In this case, two upper and two lower covers 41, 42 have been used. The two covers 41, as well as 42, are identical, but have been installed rotated by 180°. They constitute openings, which are covered by plate gratings formed on them. The plate gratings have inclined plates which, as guide elements, guide the airflow

in the direction toward the cover or bottom 14, 13. In this way a short circuit of the air, which would hamper air from entering or leaving, is avoided. The covers 41, 42, and a central cover 43, can be removed. The front wall 11 is then accessible, and service work can be performed through its openings in the front partial space.

The recirculation cooling system is installed with its rear wall 12 on a vertical wall. If it is intended to perform service work on the components of the water circuit 22, it is only necessary to remove the receiver housing 10 from the vertical wall. Then the open rear wall 12 permits access to the rear partial space.